Enclosed Combustors Installation, Operation & Maintenance Manual

Contact - 303-659-6801
www.leedfab.com

WARNINGS

WARNING

CAREFULLY READ AND FAMILIARIZE YOURSELF WITH THE CONTENT OF THIS MANUAL AND OTHER EQUIPMENT DOCUMENTATION BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE ANY EQUIPMENT

CAUTION

INCORRECT INSTALLATION, OPERATION, ADJUSTMENT OR MAINTENANCE OF COMBUSTION EQUIPMENT CAN LEAD TO BODILY INJURY OR DEATH AND/OR SERIOUS DAMAGE TO PROPERTY. FOLLOW ALL SAFETY PRECAUTIONS AND MAINTENANCE RECOMMENDATIONS PRIOR TO, AND DURING USE OF ANY COMBUSTION EQUIPMENT

CAUTION

PILOT IGNITION SYSTEM GENERATES 20KV - 40KV HIGH VOLTAGE OUTPUT WHICH CAN CAUSE BURNS OR CARDIAC ARREST. DO NOT TOUCH OR PLACE ANY OBJECT NEAR THE IGNITION COIL'S HIGH VOLTAGE TERMINAL OR CONNECTED IGNITION WIRE WHILE THE PRODUCT IS OPERATING. EVEN WITHOUT MAKING PHYSICAL CONTACT WITH THE TERMINAL, IT IS POSSIBLE TO DRAW A SPARK FROM SEVERAL INCHES AWAY

CAUTION

FAILURE TO PROPERLY GROUND THE PILOT ASSEMBLY BACK TO IGNITOR GROUND SCREW MAY RESULT IN ACCIDENTAL ELECTROCUTION, PRODUCT DAMAGE, OR SIMPLY FAILURE TO IGNITE THE PILOT

OVERVIEW

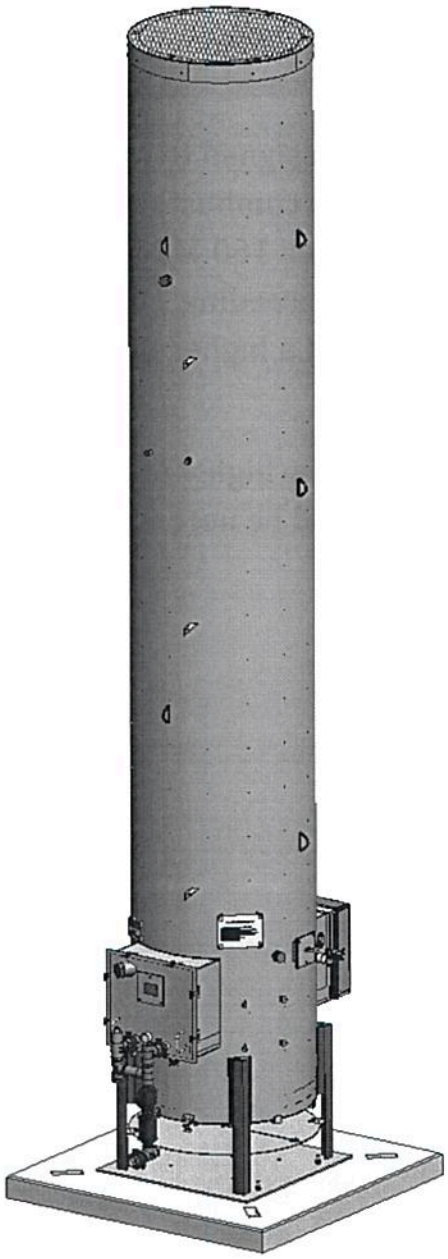
Combustion of natural gas, vapors and other residual gases at oil well facilities, gas and liquid loading facilities, tank farms and process plants is necessary to maintain environmental quality, safety and for regulatory compliance.

Leed combustion systems are designed to operate at high efficiencies (>99%). Typical operating pressures for combustors range from 0 to 16 oz. /in2 and can combust gas volumes to over 160 MSCFD. Enclosed Combustors are not designed to handle pressures exceeding 16 oz. /in2 and the main combustor gas should not be supplied from a higher pressure source such as a separator or wellhead.

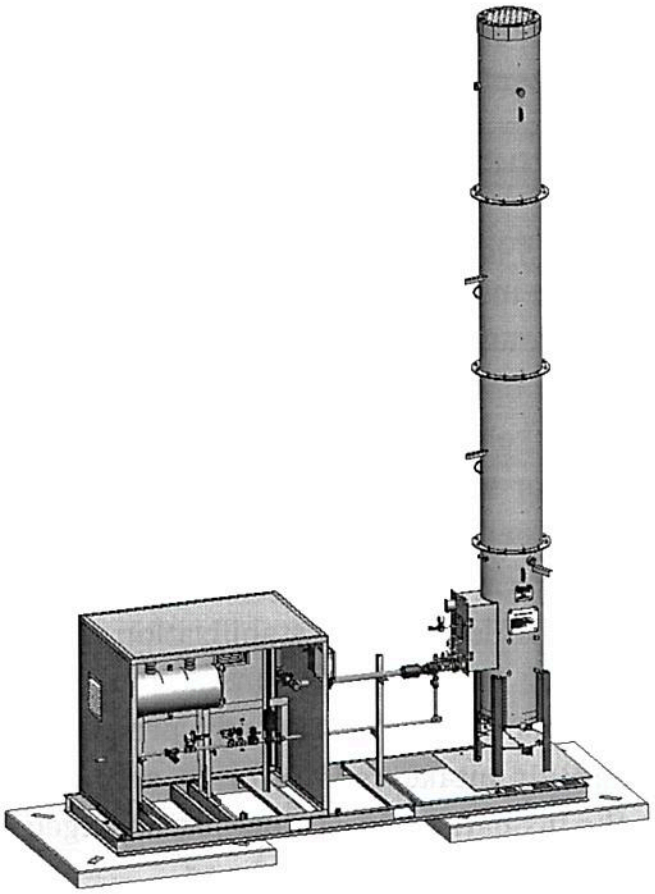
The Leed system is designed to be highly efficient and very simple to maintain. Only routine maintenance should be necessary to keep the combustor burning at peak performance.

INSTALLATION

Single Combustor Stack



Skid Mounted Combustors



Site Selection and Preparation

A location for the combustor should be chosen that is an appropriate distance from any gas emission source as defined in your company's design practices. In the absence of company specific design practices, it is recommended that the combustor location is 75 – 100 feet from any source of fugitive emissions.

Shipping and Receiving

- Inspect all equipment upon receipt and notify Leed Fabrication, no later than 10 days after receipt, of any shipping damage.

- When loading and off-loading the combustor and other ancillary equipment, make sure proper equipment and personnel is employed and adequate support and surface protection is provided to avoid both structural and superficial damage on the supplied equipment. **Special attention is required with handling stacks to avoid damage to paint and wind diverters.**

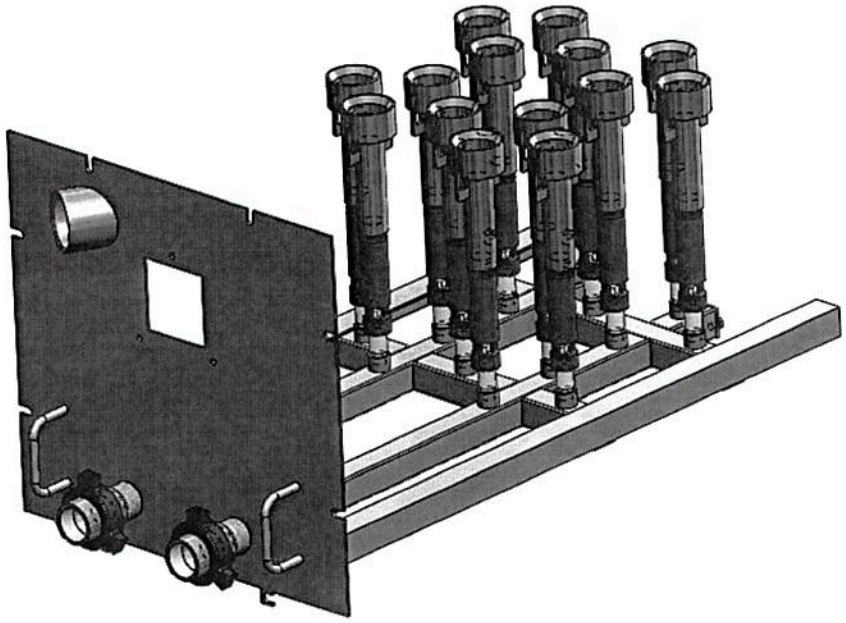
Installation Process

- Make sure all equipment drawings supplied with unit are available prior to starting the installation process.
- Flat, stable ground should be chosen for setting the combustor. Concrete foundation or optional concrete pad provided with the combustor shall be used to make sure adequate support is available for the equipment.
- The combustor should be set with appropriate heavy lifting equipment and qualified personnel. The combustor base assembly is designed with lifting eyes located on the stack. Additional lifting lugs have been provided for off-loading and stabilization when setting the combustor.
- Before setting the stack, the insulation on the interior of the stack should be inspected. Remove any protective covering over the bird screen and air intake cells prior to setting the stack and thoroughly inspect the insulation. Any insulation damaged during transportation or storage shall be repaired or replaced.

⚠ NOTE

IT IS RECOMMENDED THAT THE BURNER BRACKET ASSEMBLY AND THE PILOT ASSEMBLY ARE REMOVED PRIOR TO SETTING THE COMBUSTOR STACK. THIS ENSURES THAT NO DAMAGE OCCURS TO THE BURNER HEADS OR PILOT

- If the Burner Bracket Assembly is not already in place, align the outside angles on the burner bracket with the angles located inside the burner box. Slide the assembly until it is self-supported.

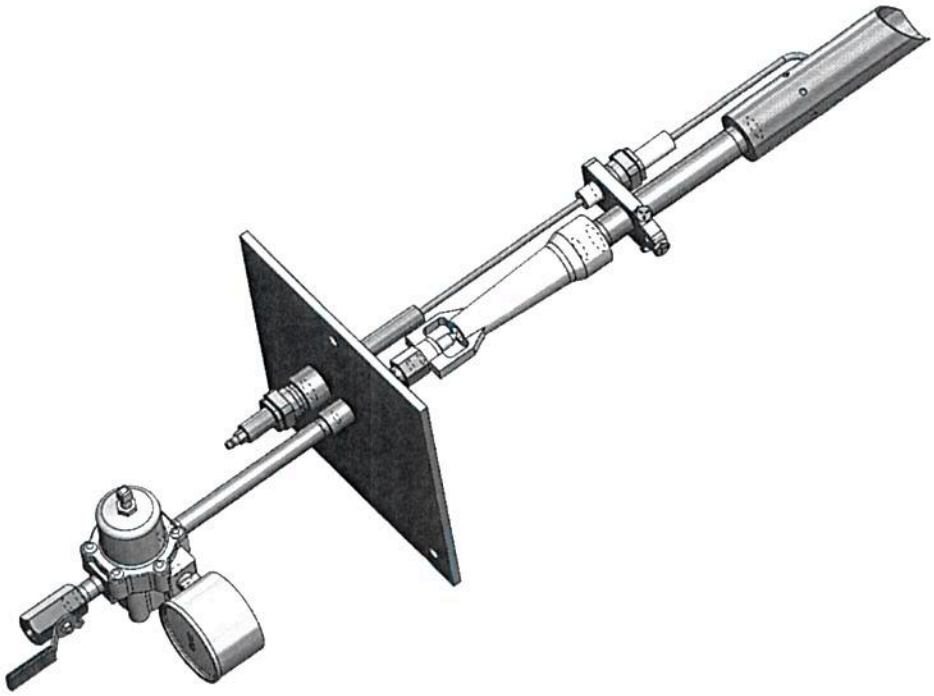


- The burner heads are installed on the couplings located on the Burner Bracket Assembly. The lower nozzle should be adjusted to locate ¼" below the inlet of the Venturi Mixer. To get more premix air, the nozzle can be adjusted to NO MORE THAN 3/8" from the entrance of the Venturi Mixer.

⚠ NOTE

IF THE NOZZLE IS SET MORE THAN 3/8" FROM THE VENTURI ENTRANCE, THERE IS A POSSIBILITY THAT THE STACK AIR VELOCITY MAY DRAW THE GAS OUT OF THE VENTURI THROAT AND IGNITE. OUTSIDE OF THE BURNER HEAD

- Pilot Assembly is normally located on the side of the combustor stack. There is an alternate location for the pilot assembly on the front of the combustor stack. The assembly is easily accessible by sliding out the burner bracket or removing the plate in which the pilot assembly and igniter striker is mounted.



- Install ignition module and/or BMS system supplied with the unit. Please review attached manufacturer installation instructions before making any connections.
- If the inlet manifold is not already installed, proceed to install according to equipment drawings. Standard inlet manifold configuration shall include inline flame arrestor, block valve, gauges and other controls designed for the specific application.

Interface Connections

- Make sure all equipment interface drawings are available prior to starting the installation process.

- All piping should be designed and installed in accordance with regulations, recognized piping standards and company safety standards.
- The inlet piping to the combustor should be designed and installed to avoid liquid collection points, minimize pressure drop and freezing issues in field piping leading to the combustor. Installation of a Liquid Knock Out tank is strongly recommended.

⚠ NOTE

CONTACT A LEED FABRICATION REPRESENTATIVE FOR LIQUID KNOCK OUT RECOMMENDATIONS IF THE COMBUSTOR IS INSTALLED FOR USE WITH POTENTIALLY WET FEED GAS. CALL 303-659-6801

- A block valve is located in front of the pilot regulator. Stainless steel tubing and fittings should be run from the pilot source gas to this valve. Care should be taken to avoid piping that may cause freezing or trip hazards.
- Install Electric supply to the ignition module and/or BMS system.
- Install ancillary controls such as remote start/ stop, ESD and thermocouples.
- Make sure conduit and wiring are properly routed and terminated to BMS box.
- Install any other instrumentation associated with the system. Refer to equipment drawings before making any connections.

OPERATION

Pre Start-up Activities

Inspect all components of the combustor according to the following guidelines:

- Inspect all piping and fittings. Care should always be taken to make sure that all piping connections are tight and no leaks exist in the system.
- Check to confirm that all burner heads are installed according to this manual.
- Make sure the sight glass and test port plugs are properly installed.
- Removable air intake cells should be inspected prior to start-up. Make sure there is no obstructions or access ways adjacent to air intake cells
- Make sure that the deflector plates are properly installed after inspection or cleaning.
- Make sure the ignition system is installed to manufacturer recommendations.
- Confirm pilot gas supply and power supply availability.
- Confirm that all areas surrounding the equipment ignition source are tested and free of flammable gases or vapors.

Initial Settings

Make sure the following items are properly set before any testing or start-up activity is performed:

- Verify that block ball valve to the main gas supply is COMPLETELY CLOSED prior to starting the ignition sequence. If gas has leaked by the main supply ball valve, the operator must shut the valve and allow the combustor to vent for a minimum of 15 minutes prior to re-starting the ignition process.
- Check that pilot fuel gas is running to the combustor.
- Check that the pilot assembly is secured and the igniter is functioning properly.

- Open the block valve on the pilot assembly to flow gas through the pilot. Adjust the regulator to 6 – 8 psi. Close the ball valve to the pilot supply and allow the pilot gas to clear the stack for approximately 10 minutes.
- Use the ignition module and/or BMS system to ignite the pilot. If the pilot is not ignited after 10 seconds, shut the pilot gas and check the installation and function of the ignition system.
- Test Operation of automatic shut-off valve located on field piping leading to the combustor.
- Verify that any other operational safety shutdown systems, i.e. ESD, Thermocouples, PVRV, etc. are fully functional.
- System is now ready for initial operation

Initial Operation

Once all initial setting and testing activities have been performed, combustor is ready for operation:

- Ignite Pilot using ignition module and/or BMS system to ignite the pilot. Confirm flame presence visually and also via annunciator (light) on ignition module and/or BMS system.
- To Ignite the Main Burner, slowly open the block valve to the main supply gas. The burner heads should ignite and the combustor will be running smoothly and quietly. If the heads do not light after 15 seconds, shut off the main supply line and allow the gas in the combustion stack to vent for a minimum of 15 minutes.
- For systems with automated shut-off valves, ignition would not occur until control system / BMS allows valve to open based on specific logic defined for the system.

MAINTENANCE

Preventive Maintenance

Weekly Inspection:

- Inspect all connections and make sure that they are tight and no leaks exist in the system.
- Inspect air intake cells. High pressure air might be used to clean up the air intake cells prior to starting the unit.
- Confirm proper operation of the ignition system / BMS.

Quarterly Inspection:

- Confirm that thermocouples and all basic instrumentation (gauges, sight glasses, transmitters/switches, etc.) are in correct working order. Replace faulty items as required.
- Inspect and clean detonation/flame arrestors as required.
- Confirm set points on pilot fuel gas system and adjust as required.
- Confirm proper operation of the ignition system / BMS.

⚠ NOTE

CONTACT A LEED FABRICATION REPRESENTATIVE FOR INFORMATION ABOUT OUR PREVENTIVE MAINTENANCE PROGRAMS. CALL 303-659-6801

Troubleshooting

This section is designed to aid the operator to troubleshoot commons issues for other problems not included in this section please contact Leed Fabrication. The following is a list of issues with corresponding possible solutions:

1. Pilot does not ignite

a. Confirm power supply to ignition system / BMS. For systems with solar panels, confirm proper operation of the system, check battery and replace as required.
b. Confirm flow of fuel gas supply is available and all valves are correctly aligned.
c. If ignition system/BMS is energized (on), check internal fuse and replace as required.
d. Confirm pilot solenoid valves are energized during ignition sequence.
e. Confirm ignition system/BMS is properly programmed. See attached vendor documentation for additional detail
f. Check ignition wire is properly connected to ignition coils and to the ignition rod.
g. Check ignition rod gap inside pilot assembly. Gap should not be bigger than 1/2".
h. Check Pilot assembly is properly grounded.

2. Pilot has visible flame but cannot be detected

a. Adjust rod positioning and /or gas pilot gas pressure.
b. Check wiring inside ignition system / BMS.
c. Confirm grounding of pilot assembly.

3. Main Burner does not ignite

a. Confirm flow on gas/vapor line and that all valves are open and correctly aligned.
b. See item 5 for additional troubleshooting information.

4. Stack High Temperature

a. Verify flow rate and any possible process upset upstream of the combustor. Combustor might be operating outside design range (over fired).
b. Check stack and line thermocouples for thermocouple failure.

c. Confirm proper wiring termination of thermocouples inside ignition system / BMS

5. High Pressure on inlet line / Decreased capacity

a. Check for Process Line blockage. Verify that there are not liquid slugs or liquid carryover from process upsets.
b. Check that all block valves are operating correctly. Replace as required.
c. Check for inline flame/detonation arrestor blockage. Clean and/or replace as required.
d. Check for burner blockage. Look inside the stack through sight port and visually confirm that there are not solid objects or liquids on top of the burner. Pull out burner rack and clean and or replace burner heads as required.

6. Smoking

a. Check for Process Line blockage. Verify that there are not liquid slugs or liquid carryover from process upsets. See item 5 for additional troubleshooting information.
b. Confirm and air intake are clean and there is no inside or outside blockage. Blow out with pressure air as required.
e. Heavy hydrocarbons or water in the gas/vapor stream dropping out of vapor phase. Troubleshoot process upstream of the combustor to avoid liquid carryovers. Pull out burner rack and clean and or replace burner heads as required.
f. Check for burner blockage. Look inside the stack through sight port and visually confirm that there are not solid objects or liquids on top of the burner. Pull out burner rack and clean and or replace burner heads as required.

SPARE PARTS LIST

The following spare parts list is the minimum recommendation for the commissioning and operation of this type of unit. Customer specific details such as brand names, model numbers and quantities may apply. Additional spare parts requirements such as 2 year operation are not covered in this list:

1. Pilot Pressure Gauge
2. Main Line Pressure Gauge
3. Stack Thermocouple
4. Pilot Thermocouple or other applicable flame detection device
5. Spare Ignition Rod
6. Solenoid Valves Pilot
7. Shut-off Valve Assembly or Shut-off valve actuator

REFERENCE DRAWINGS

VENDOR LITERATURE

Ignition System / BMS